INTEGRATION OF AI AND ML IN THE INDIAN CRIMINAL JUSTICE SYSTEM AND IN IN E- GOVERNANCE REFORMS: AN OVERVIEW OF RECENT LEGISLATION AND JUDICIAL ADOPTION

Abstract

Over the course of the last several years, Artificial Intelligence (AI) and Machine Learning (ML) have become the focus of a significant amount of discussion, especially in relation to the breadth and depth of its possible applications across a variety of sectors. The legal system's interest has been sparked as a result of the broad application of AI ecosystem technologies. In spite of the fact that the Indian legal system has started integrating ICT, the incorporation of AI into the judicial system will unquestionably improve the efficiency of service delivery. The analysis of the study is based on the objectives of developing the importance of AI and ML in government organizations, analyzing the possible influence that AI might have on the judicial system. Secondary data analysis technique is used to analyze the data and further developing the systematic review on the analysis, addressing both immediate and prospective challenges and proposing viable solutions to each of these issues. The development of the importance of e-governance in this developing country is discussed based on the infrastructural needs It is found in the study that the importance of the knowledge of AI and ML, playing a primary important role in developing countries, may act as a driving force to revolutionize the entire system.

Keywords: Artificial Intelligence, Machine Learning, Blockchain, Digitalisation, Access to justice, E-governance.

I. INTRODUCTION

Artificial Intelligence (AI) and Machine Learning (ML) are the two most significant parts of the computer system and they are correlated with each other. As stated by Acs et al. (2020). In today's world, these two are the most trending technologies which are used for creating intelligence systems. Artificial Intelligence creates an environment by means of a computer system using the thinking capabilities of a human mind (Ahmad et al 2021). Machine learning, being a part of AI, creates the mode of data and information based on human thinking capabilities (Androutsopoulou et al. 2019).

E-governance nowadays has started with a buzz nevertheless the UN members started to incorporate technological AI in the applications. According to Aung et al. (2021), the gaining media from the intelligence department is started to incorporate AI and ML gaining the governance domains. Thus, the problem statement of the study is to analyze the integration of AI and ML in e-governance regulations.

The deep learning theme of governance faced several challenges in adopting the features of AI and ML. The highest market share as of 2021 was the IT sector standing at 51.8% (Statista, 2023). The data mining projects are initially generated by Machine learning through statistical and growing algorithms (Batra et al. 2021). There are three key issues that are attempted to be addressed in this study. The ability of a) machine learning tools to aid in intelligent scheduling of cases, b) AI-enabled programmed to extract the correct position of law from a multitude of precedents, and c) robots to determine matters of law. In order to provide insight into these concerns, the authors of this research surveyed legal practitioners throughout the world and identified specific applications where AI has already made significant contributions to the judicial system. It notes that although in the United States AI is being utilized to create risk assessment tools, in Singapore it is mostly employed for voice translation. Citizens in nations such as Russia, Mexico, and China are receiving legal counsel from machines, and courts are using robots to assist them decide whether or not to award pensions. (Euchner, 2019). The paper notes, however, that in the Indian context, AI adoption would mostly be tied to enhancing administrative efficiency and streamlining decision-making. In addition, there are factors to think about when using ML algorithms or deep-learning technologies to help make decisions about motor vehicle compensation claims. The paper also provides an outline of potential obstacles that might arise throughout the rollout of AI. The main difficulties are designing a decision-support system that complements human judgement rather than replacing it, as well as maintaining its transparency, explain ability, and objectivity.

Yet, the paper recommends a comprehensive framework to tackle such interconnected problems. (Norikazu, 2016). The significance of the research is based on the theme of analyzing the Artificial Intelligence and Machine learning technologies used in the development of E-governance. Furthermore, the analysis of the concepts of generating the development procedures in incorporating intelligence technologies for the government will be studied.

The purpose of the study is to generate the knowledge of incorporating Artificial Intelligence along with Machine learning in developing E-governance. In particular, the research the research aimed to fulfill the following objectives:

- To study Integrating AI Technology Further into Criminal Justice System
- The use of technology inside prisons
- To study neuron-Based recidivism prediction using artificial intelligence
- To analyze the techniques for assimilating AI and ML in government organizations;
- To develop the knowledge of learning the intelligence technologies;
- To portray the aspects of developing intelligence technologies in the organizations;
- To assess the general ways of incorporating AI and ML in government organizations.

II. Literature Review

AI in development of the infrastructural projects

The importance of AI in government projects paved a way for the development of the general process of growing concepts of e-governance. According to Bellemo et al. (2022), toilet con-

struction in public areas is detected using AI software. In addition to that it ca also be stated that in the agricultural department, AI is used to detect the related issues generally hampering the crop, mainly, weather, soil, water capacity, and fertilizers (Chen et al. 2020).

AI tools are used to detect criminal activity in public places by incorporating CCTV cameras. As mentioned by Chohan et al. (2022), the general use of AI in detecting criminal activities for face recognition in places of public gathering. On the other hand, Duan et al. (2019) have commented that the purposes of AI in other business activities are even more important. Hence, the fact of incorporating the technology in this field, an AI renewable energy generator predicts the load of the grid in the management of the growth of the efficiencies.

Ways of incorporating IT

The tools of generating the applications by AI in government organizations are helping the needs of storing the huge data of public communications and databases are made easy. As mentioned by Gill et al. (2022), huge data storage is managed by the intelligence programming of digital technology. On the contradictory, Lee & Perret (2022), commented that rapid development in data storage and consumption is missing the hold of the technology, needed for automated and proper systems in managing government data to be incorporated. Therefore, architectural developments and infrastructural development is equally important for the growth of intelligence in information technology.

Literature gap

The basic use of AI and ML is incorporating intelligence technology in e governance meeting the aspects of the digital world and developing renewable cost-effective energies (Mah et al. 2022). However, many gaps in identification are seen in the development of AI and ML in government organizations. Hence, a proper approach of study towards meeting the aspects of meeting drawbacks of integrating AI and ML has to be met to neutralize the problems of mass media and public consideration

III. METHODOLOGY

The Indian judicial system is notorious for its glacial speed of justice delivery, its voluminous volumes of paperwork, its steadfast commitment to conventional and traditional approaches, and its reluctance to embrace innovative technology. The fact that younger attorneys are more receptive to the concept of integrating technology into the judicial system is, nonetheless, a positive development. In light of the fact that the groundwork to establish this ecosystem is presently being put in place, it is vitally crucial that a thorough plan be developed for the incorporation of AI into the legal system in order to provide a level playing field for the deployment of AI. The report is helpful since it provides a detailed road map of the procedure that has to be followed. According to the findings of the paper, the judicial system would need both the establishment of operational support and meticulous planning in order to facilitate the integration and phased deployment of AI. The study just lays the groundwork to start a dialogue about the integration of AI into the legal system and makes it possible to utilize AI in the future in a manner that is both ethical and measured.

IV. Integrating AI Technology Further into Criminal Justice System

Over through the course of the past several decades, AI has shown its ability to improve the quality of our daily lives and provide solutions to many of the world's most pressing problems. Self-driving cars, facial recognition programmes, and cancer-detection programmes are just a few of the numerous ways in which artificial intelligence might help advance human civilization. Until 2024, the global market for AI is expected to grow to about half a trillion US dollars, according to market research firm IDC. As a result, this very powerful technology will continue to gain traction in many fields. Based on the research of (Dennett, 2019) Among the most fascinating uses of AI now under development is in the judicial system. For sentencing purposes, artificial intelligence might assess the risk presented by a defendant.

It's hardly unexpected that questions concerning the potential for prejudice in the use of AI to the realm of criminal justice have arisen. Nonetheless, with proper training and implementation, algorithms may be less prejudiced than humans. Yet, there are vital social and ethical factors to take into account, the most important of which are reliability and transparency. These concerns must be addressed if AI is to be used effectively to assist courts in making sentence decisions and to provide accurate appraisals of offenders' risk and needs.

Anyone interested in openness, discrimination, and the protection of personal data should keep reading to discover more about how artificial intelligence is employed in the legal system, where and how AI technologies could make a difference, and how these challenges might be solved. Many sentencing decisions may be skewed or influenced by factors unrelated to the case at hand, perhaps leading to biased outcomes. This is due to the fact that people have inherent biases, distinctions, and divergent opinions. For instance, one study discovered that judges' sentence decisions were much more lenient in the morning and just after lunch. Indeed, this held true for each of those periods. The opposite was true at the end of the day and just before they took a break for the day, when they were far more likely to apply harsher sanctions (Navarro).

This is only one example of how the judgements that judges make about sentences might be influenced by a factor that is completely random (the time of day of the trial). In point of fact, the choices made by judges may be swayed by a wide variety of "irrelevant" factors, which might result in judgements that are not entirely impartial. For instance, given that judges might have quite divergent points of view from one another, a sentence that, in the eyes of one judge, seems to be fair and impartial may, in the eyes of another judge, be seen as ludicrous. In addition, every judge has their own favored style of sentencing: some judges support parole, while others prefer to give prisoners additional time in jail for particular offences. This is owing to the fact that each individual has their own unique perspective on the efficacy of various forms of punishment and rehabilitation. As a consequence of this, the punishment meted out to a criminal may be quite different, depending entirely on the judge who presided over their case.

Using computers with artificial intelligence to provide assistance to judges as they deliberate over sentence options is one approach that might be used to address this prejudice. One of the most important ways that artificial intelligence is being utilized in this industry right now is through systems that are known as risk/needs assessment tools. Several of these resources are algorithms that can assess a criminal's likelihood of reoffending based on information about them. A higher risk score indicates that the offender is more likely to commit more offences. According to research (Ogonjo et al., 2023).

For over a century, risk and needs assessment methods have been utilised to help the justice system properly assist and sentence persons so that they might be as productively reintegrated into society as is humanly feasible after release from prison. Contrarily, artificial intelligence wasn't put to any practical use until 1998. The application of AI for risk and needs assessment is a major step forward when compared to traditional methods like interviews and questionnaires. Due to limitations in data evaluation, they were not as trustworthy as the fourth-generation technologies that were bolstered by AI.

V. THE USE OF TECHNOLOGY INSIDE PRISONS

A law enforcement officer sitting close to a detainee in prison

The deployment of innovative tools does not end with a person's conviction. Artificial intelligence is being employed in correctional institutions for both the automation of security measures and the rehabilitation of offenders. For instance, a Chinese prison housing high-profile convicts is purportedly adopting an AI network to identify and track inmates 24/7, alerting guards if anything suspicious occurs.

In addition, offenders' criminogenic needs are assessed using AI techniques; some of these individuals may be amenable to treatment and a subsequent change in their offending conduct. For example, in Finnish prisons, artificial intelligence (AI) training algorithms are used as part of a training programme. The inmate population is the intended audience for this programme. To wit: (Elliott & Thomas, 2017) Inmates may choose to answer simple questions or read content selected from numerous online sources. Vain, the firm in charge of coordinating the inmate labour and teaching ex-convicts marketable skills that would allow them to find gainful employment once they are released from jail, collects data from these endeavors. Inmates are given the tools they'll need to succeed once they're released from jail, and Vain is there to assist them do just that.

Academics have proposed using AI to address the issue of mass incarceration in the US by eliminating the need for solitary confinement. Inmates may be able to employ intelligent assistants like Amazon's Alexa as friends while confined. Some prisoners may find relief from the emotional stress they've been experiencing as a result of having such supportive pals in prison. As a result, there will be less debate over the efficacy of solitary confinement and the harms it produces. The misuse of AI might lead to the institutionalization of the death penalty or the normalization of solitary confinement as a form of punishment. (2017)

VI. NEURON-BASED RECIDIVISM PREDICTION USING ARTIFICIAL INTELLIGENCE

Predicting criminal conduct in the future using AI has shown to be a rather accurate endeavor. A study conducted by researchers at Stanford College and the University in California, Berkeley, found that automated risk assessment systems are much superior than human analysts when it comes to simplifying the intricate workings of the criminal justice system and drawing reliable findings. Keep in mind that with only a few pieces of information, individuals can accurately predict which criminals will be apprehended for a second time. But, when there are more variables to consider, algorithms tend to do better than humans. In certain cases, the percentage of accuracy for predicting which repeat criminals would be apprehended was more than 90%. Compared to these machines, human accuracy was only about 60%. Although there is some debate regarding the use of algorithm-based tools, studies have shown that in scenarios mimicking real-world criminal justice settings, risk assessment algorithms provide more accurate and precise conclusions compared to human judgement (Fidell, 2016).

If AI is to be used appropriately in the criminal justice system, then the rights of individuals to know how the AI and algorithms operate must always be balanced with the rights of corporations to maintain their data and material. Decisions made by AI should be evaluated to see whether they should be held to the same or higher standard than those made by humans. There is a certain air of mystery around the inner workings of artificial intelligence systems like neural networks. In the event that this is the case, perhaps not even the developers of the AI understand the logic behind its actions. You might think of machine learning as a box containing knobs that, when turned, produce diverse outcomes. Yet thus far, nobody has cracked the code on what's going on within the box. It's a complex system that gets better with time and more data, but we don't know exactly how it achieves it yet. Because of the algorithm's opaqueness and the difficulties of articulating its rationale, judges who utilize the technology cannot objectively analyse its merits and downsides. Instead of understanding how their score was calculated, students must blindly apply it to phrases. Judges who rely too much on algorithms without a thorough grasp of their inner workings may wind up being far more prejudiced than they would be if they were working in the traditional method, without the aid of an algorithm. (2020)

We have shown that bias is the key ethical challenge when using AI in the criminal justice system to assess risk or requirements. There are several opportunities for introducing bias into AI systems. If the AI is a neural network, it will need training data. In order to teach AI to distinguish between, instance, a dog and a cat, it must be exposed to examples of both. Hence, it is necessary to combine data on individual offenders' recidivism rates into a neural network that may be used as a risk/needs assessment tool. Unfortunately, the information used by AI systems frequently serves to further instill bias in its users.

It's possible that, in the end, machines are just as biased as humans. It's possible for two people to have vastly different ideas on what constitutes a violation of the law and how severe a penalty should be. Because of the information they are fed and how they interpret it, algorithms are inherently biased. There are two distinct kinds of prejudice. Human prejudices, which AIs are meant to eradicate, are ironically the cause of the biases themselves.

The fact that people interpret the law in different ways to achieve justice that best serves their own interests may help to explain why bias exists among us. Looking at the numbers, however, we may see that what seems to be a well-functioning judicial system is really made up of individuals who are inconsistent in their own assessments or who cannot divorce their personal convictions from the impartiality and reason required to be an effective judge. It's important to keep in mind that AI is always developing, whereas human decision-making remains static. We are refining methods to remove bias from algorithms that are challenging to implement using human cognition alone. (2006)

Some people may worry that their privacy is being invaded by AI systems because of the method in which they collect and use data. This is why people need to provide their explicit consent prior to any processing of their personal information. This includes the right to not be subject to an automated decision, as well as the principles of data reduction and purpose limitation (2017). Some helpful context may be found in the General Data Protection Regulation (GDPR): it is the controller's responsibility to take appropriate precautions to protect the rights, freedoms, and legitimate interests of data subjects while processing their data automatically. The GDPR ensures individuals have access to "meaningful information about just the logic involved" when their data is being processed automatically. In Article 11 of the Law Enforcement Directive, it is stated that automated decisions with adverse legal effects related to the data subject or can significantly affect them are prohibited unless authorized by Union or Member State law that also secures relevant safeguards for the rights and freedoms of the data subject; in fact, judgments generated solely by an algorithmic tool will never be valid under the Law Enforcement Directive. (Ogonjo et al., 2023).

The secondary qualitative data analysis is followed in this study using the data analysis of literature search from the scientific records. This will give a clear view of the perspectives of the study using participants. The data is collected from government websites, books, and journals. As stated by Reddy et al. (2021), the sharing, collecting, and analyzing of the data have become generally easier in this mode of secondary qualitative data analysis keeping the confidentiality of the participants altogether. This study develops a systematic review of the data being analyzed going hand in hand with the methods of explicating the methods to identify and target the relevant secondary research.

VII. Findings

Analyzing the techniques of assimilating AI and ML in government organizations

The past few years have boosted the need for Artificial Intelligence and Machine learning from private firms to government organizations. According to Reis et al. (2019), Medicare and healthcare facilities have invariably developed the data analysis method with machine learning in their hospitals and institutions for fast service providers. In the education system, the data analysis of the institutions, schools, colleges, and universities is been easier using AI chatbots (Roh et al. 2019). Avoiding the long queues of admission and other merchandise

purposes the websites developing AI in the colleges have started to incorporate the technologies of online payment (Yigitcanlar et al. 2020).

Developing the knowledge of learning intelligence technologies

Developing the knowledge of collecting and analyzing the general role of farming parameters using AI such as soil conditions, fertilization, and irrigation is in much use. As stated by Sun et al. (2019) evolving precision farming towards the development of the food production level and generally reducing the amount of waste without affecting our environment. Monitoring and controlling the vehicles for surveillance purposes have helped in evaluating the learning technologies (Veale, M., & Brass, I. 2019).

The type of advanced technology in developing robot soldiers in the futuristic environment using weapons and deploying robot soldiers has been planned by the US government by 2025 (Wamba-Taguimdje et al. 2020). This in turn will change the overall idea of AI in the public and help in developing the technology at full pace.

Assessing the general ways of incorporating AI and ML

The general way of developing AI and ML knowledge in the public is to share information through digital media platforms. As stated by Wirtz et al. (2019), the traffic control department is incorporating AI in the department to synchronize the traffic control and data system. Therefore, in order to manage the data for the hustle-free road for vehicles procedure is followed. This compensates for the smooth flow of public traffic in peak hours generally not causing any inconvenience for the public (Yigitcanlar et al. 2020).

Portraying the aspects of comprising AI and ML

The need arises for a populated country to store such huge data in the booklets and organize the data accordingly. As stated by, Veale, M., & Brass, I. (2019), such matter is of great concern for the government in order to work efficiently and effectively with the help of the public sector. The usage of similar health machinery, technologies, and analytics to entertain the maintenance of the roads, schools (government-organized), colleges, hospitals, and universities. The security systems of the government are secured using AI and self-learning using advanced techniques of threat detection (Reis et al. 2019).

VIII. Discussion

The use of AI and ML in developing government institutions and organizations as discussed in the thematic analysis infers the better development of the infrastructure. As stated by Sun et al. (2019), huge data-collecting methods are reorganized in artificial intelligence technology and compressed into a digital mode for better organization. Secondary qualitative data analysis develops the idea of accessing the data from secondary websites and analyzing the data using a systematic review (Roh et al. 2019). This helped the study to develop the ideology of portraying the need of integrating AI and ML in government organizations.

The parent idea of organizing the data from the websites and utilizing the data source for such purposes, therefore, improves the development of the country. In India, the development of such technologies is improving the overall concept of Artificial intelligence in the current world Sun et al. (2019). Thus, sufficient awareness of cybercrime and threats need to be mon-

itored and shared for public attention so as to develop the knowledge of using AI. The major use of the Indian government in developing AI was the initiation of "e-aadhar" as a means of unique identification ID supported by Indian government (Veale, M., & Brass, I. 2019). This step towards the development of AI brought a mass change in the e-governance system.

Sufficient data available in government websites are used for public purposes. As stated by Wamba-Taguimdje et al. (2020), these data have to be synchronized systematically, the task looks for the development of the system as well as trained professionals in the department. The incorporation of the traffic-based data system in the hustle-free traffic for the commuters is also important. The government-run institutions developed the websites for hustle-free admissions and payment purposes in the schools, colleges and universities (Duan et. al. 2022).

Furthermore, data analytics in the field of artificial intelligence is a major issue for the development of the projects and organizations in the government. According to Mah et al. (2022), the duplicity of data is reduced and the most general and authentic data is generated in the websites. The corporate sectors in public views have already developed the use of the AI and incorporated machine learning for their staffs for fast generating data and organizing the data (Mohammed, I. A. 2021). Comparing to that, government run organizations need more development in the e-governance sector.

The algorithms followed during the machine learning develop specific software codes for the increased performance of the IT sectors. In contrary, the government organizations have developed the initial concept of technology acceptance model for developing their processes (Gill et al. 2022). Development in such factors will further increase the effectiveness of Artificial Intelligence (Dwivedi et al. 2021). The study further proceeds in depth development of the processes of artificial intelligence and sharing machine learning in the organizations. This in turn will change the overall idea of AI in the public and help in developing the technology in full pace.

IX. Conclusion

It is imperative that we strive towards resolving these social and ethical concerns in order for artificial intelligence to be used in the legal system to the greatest extent feasible. Since there are certain circumstances in which total transparency is not achievable in either the decision-making process of AI or humans, we should also question how crucial it is that the algorithm be completely open. The presence of bias is a problem in both humans and AI; nevertheless, the vast majority of algorithmic bias is the consequence of human prejudices being incorporated into AI's training data. When it comes to the deployment of artificially intelligent risk/needs assessment tools, the most important thing to focus on is making sure that the training data is objective. With this in mind, it is strongly recommended to seek the assistance of a group of seasoned specialists who will take into account all aspects of the judicial system and do their best to ensure that AI is implemented appropriately and successfully.

Ways of incorporating the significance of AI and ML in e-governance have been developing ever since and the population of a developing country is soaring high. The general view of storing a huge amount of data on government websites and further assimilating the data from

the sites for developing the organizations is in high demand. Therefore to conclude that the need arises in the infrastructural and economical development in the sector of intelligence this in turn pushes the need for machine learning in Information technology.

References

Acs, B., Rantalainen, M., & Hartman, J. (2020). Artificial intelligence as the next step towards precision pathology. *Journal of internal medicine*, *288*(1), 62-81.Retrieved from: https://onlinelibrary.wiley.com/doi/pdfdirect/10.1111/joim.13030 [Retrieved on: 14/03/2023]

Ahmad, T., Zhang, D., Huang, C., Zhang, H., Dai, N., Song, Y., & Chen, H. (2021). Artificial intelligence in sustainable energy industry: Status Quo, challenges and opportunities. *Journal of Cleaner Production*, *289*, 125834.Retrieved from: https://www.sciencedirect.com/science/article/am/pii/S0959652621000548 [Retrieved on: 14/03/2023]

Androutsopoulou, A., Karacapilidis, N., Loukis, E., & Charalabidis, Y. (2019). Transforming the communication between citizens and government through AI-guided chatbots. *Government information quarterly*, *36*(2), 358-367.Retrieved from: https://www.icsd.aegean.gr/publication_files/980795393.pdf [Retrieved on: 14/03/2023]

Aung, Y. Y., Wong, D. C., & Ting, D. S. (2021). The promise of artificial intelligence: a review of the opportunities and challenges of artificial intelligence in healthcare. *British medical bulletin*, *139*(1), 4-15. Retrieved from: https://academic.oup.com/bmb/advance-article-pdf/doi/10.1093/bmb/ldab016/40343944/ldab016.pdf [Retrieved on: 14/03/2023]

Batra, R., Song, L., & Ramprasad, R. (2021). Emerging materials intelligence ecosystems propelled by machine learning. *Nature Reviews Materials*, *6*(8), 655-678.Retrieved from: https://www.osti.gov/pages/servlets/purl/1864296 [Retrieved on: 14/03/2023]

Bellemo, V., Lim, G., Rim, T. H., Tan, G. S., Cheung, C. Y., Sadda, S., ... & Ting, D. S. W. (2019). Artificial intelligence screening for diabetic retinopathy: the real-world emerging application. *Current Diabetes Reports*, *19*, 1-12.Retrieved from: https://www.researchgate.net/profile/Valentina-Bellemo/publication/334809634_Artificial_Intelligence_Screening_for_-Diabetic_Retinopathy_the_Real-World_Emerging_Application/links/5e78442d92851c-f271a0bdba/Artificial-Intelligence-Screening-for-Diabetic-Retinopathy-the-Real-World-Emerging-Application.pdf [Retrieved on: 14/03/2023]

Chen, M., & Decary, M. (2020, January). Artificial intelligence in healthcare: An essential guide for health leaders. In *Healthcare management forum* (Vol. 33, No. 1, pp. 10-18). Sage CA: Los Angeles, CA: SAGE Publications.Retrieved from: https://journals.sagepub.com/doi/pdf/10.1177/0840470419873123 [Retrieved on: 14/03/2023]

Chohan, S. R., & Hu, G. (2022). Strengthening digital inclusion through e-government: cohesive ICT training programs to intensify digital competency. *Information Technology for Development*, *28*(1), 16-38.Retrieved from: https://www.tandfonline.com/doi/pdf/10.1080/02681102.2020.1841713 [Retrieved on: 14/03/2023]

Duan, Y., Edwards, J. S., & Dwivedi, Y. K. (2019). Artificial intelligence for decision making in the era of Big Data–evolution, challenges and research agenda. *International journal of information management*, *48*, 63-71.Retrieved from: https://uobrep.openrepository.com/bitstream/handle/10547/623124/Artificial%20Intelligence%20in%20the%20era%20of%20Big%20Data%20revised%20final%20%281%29.pdf?sequence=2&isAllowed=n [Retrieved on: 14/03/2023]

Dwivedi, Y. K., Hughes, L., Ismagilova, E., Aarts, G., Coombs, C., Crick, T., ... & Williams, M. D. (2021). Artificial Intelligence (AI): Multidisciplinary perspectives on emerging challenges, opportunities, and agenda for research, practice and policy. *International Journal of Information Management*, *57*, 101994.Retrieved from: https://uobrep.openrepository.com/bitstream/handle/10547/623613/1_s2.0_S026840121930917X_main.pdf?sequence=4 [Retrieved on: 14/03/2023]

Garcez, A. D. A., Gori, M., Lamb, L. C., Serafini, L., Spranger, M., & Tran, S. N. (2019). Neural-symbolic computing: An effective methodology for principled integration of machine learning and reasoning. *arXiv preprint arXiv:1905.06088*.Retrieved from: https://arxiv.org/pdf/1905.06088 [Retrieved on: 14/03/2023]

Gill, S. S., Xu, M., Ottaviani, C., Patros, P., Bahsoon, R., Shaghaghi, A., ... & Uhlig, S. (2022). AI for next generation computing: Emerging trends and future directions. *Internet of Things*, *19*, 100514.Retrieved from: https://arxiv.org/pdf/2203.04159 [Retrieved on: 14/03/2023]

Lee, I., & Perret, B. (2022, June). Preparing High School Teachers to Integrate AI Methods into STEM Classrooms. In *Proceedings of the AAAI Conference on Artificial Intelligence* (Vol. 36, No. 11, pp. 12783-12791).Retrieved from: https://ojs.aaai.org/index.php/AAAI/article/download/21557/21306 [Retrieved on: 14/03/2023]

Mah, P. M., Skalna, I., Pełech-Pilichowski, T., Muzam, J., Munyeshuri, E., Uwakmfon, P. O., & Mudoh, P. (2022). Integration of sensors and predictive analysis with machine learning as a modern tool for economic activities and a major step to fight against climate change. *J. Green Econ. Low-Carbon Dev*, *1*(1), 16-33.Retrieved from: https://www.researchgate.net/profile/Pascal-Muam-Mah/publication/366672369_Integration_of_Sensors_and_Predictive_Analysis_with_Machine_Learning_as_a_Modern_Tool_for_Economic_Activities_and_a_Major_-Step_to_Fight_Against_Climate_Change/links/63b133eba03100368a436fdb/Integration-of-Sensors-and-Predictive-Analysis-with-Machine-Learning-as-a-Modern-Tool-for-Economic-Activities-and-a-Major-Step-to-Fight-Against-Climate-Change.pdf [Retrieved on: 14/03/2023]

Mohammed, I. A. (2021). The interaction between artificial intelligence and identity and access management: an empirical study. *International Journal of Creative Research Thoughts (IJCRT), ISSN*, *2320*(2882), 668-671.Retrieved from: https://www.researchgate.net/profile/Ishaq-Azhar-Mohammed/publication/353888035_The_Interaction_Between_Artificial_Intelligence_and_Identity_Access_Management_An_Empirical_study/links/6116a4731ca20f6f861e49df/The-Interaction-Between-Artificial-Intelligence-and-Identity-Access-Management-An-Empirical-study.pdf [Retrieved on: 14/03/2023]

Mossey, S., Bromberg, D., & Manoharan, A. P. (2019). Harnessing the power of mobile technology to bridge the digital divide: a look at US cities' mobile government capability. *Journal of Information Technology & Politics*, *16*(1), 52-65.Retrieved from: https://www.researchgate.net/profile/Aroon-Manoharan/publication/329314041_Harnessing_the_power_of_mobile_-technology_to_bridge_the_digital_divide_a_look_at_US_cities%27_mobile_government_-capability/links/5f3ef935a6fdcccc43ddcd48/Harnessing-the-power-of-mobile-technology-to-bridge-the-digital-divide-a-look-at-US-cities-mobile-government-capability.pdf [Retrieved on: 14/03/2023]

Reddy, S., Fox, J., & Purohit, M. P. (2019). Artificial intelligence-enabled healthcare delivery. *Journal of the Royal Society of Medicine*, *112*(1), 22-28. Retrieved from: https://journals.sagepub.com/doi/pdf/10.1177/0141076818815510 [Retrieved on: 14/03/2023]

Reis, J., Santo, P. E., & Melão, N. (2019). Artificial intelligence in government services: A systematic literature review. *New Knowledge in Information Systems and Technologies: Volume 1*, 241-252.Retrieved from: https://comum.rcaap.pt/bitstream/10400.26/36405/1/10.1007%40978-3-030-16181-123.pdf [Retrieved on: 14/03/2023]

Retrieved from: https://www.researchgate.net/profile/Kala-Kamdjoug-Jean-Robert/publication/340210939_Influence_of_Artificial_Intelligence_AI_on_Firm_Performance_The_Business_Value_of_AI-based_Transformation_Projects/links/5eaa905645851592d6abcf63/Influence-of-Artificial-Intelligence-AI-on-Firm-Performance-The-Business-Value-of-AI-based-Transformation-Projects.pdf [Retrieved on: 14/03/2023]

Roh, Y., Heo, G., & Whang, S. E. (2019). A survey on data collection for machine learning: a big data-ai integration perspective. *IEEE Transactions on Knowledge and Data Engineering*, *33*(4), 1328-1347.Retrieved from: https://arxiv.org/pdf/1811.03402 [Retrieved on: 14/03/2023]

Statista (2023), AI market share in India in 2021, by industry, Retrieved from: https://www.-statista.com/statistics/1180858/india-ai-market-share-by-industry/ [Retrieved on: 14/03/2023]

Sun, T. Q., & Medaglia, R. (2019). Mapping the challenges of Artificial Intelligence in the public sector: Evidence from public healthcare. *Government Information Quarterly*, *36*(2), 368-383. Retrieved from: https://research-api.cbs.dk/ws/files/58401014/rony_medaglia_et_al_mapping_the_challenges_acceptedmanuscript.pdf [Retrieved on: 14/03/2023]

Veale, M., & Brass, I. (2019). Administration by algorithm? Public management meets public sector machine learning. *Public management meets public sector machine learning*.Retrieved from: https://discovery.ucl.ac.uk/id/eprint/10072507/1/VealeBrass.pdf [Retrieved on: 14/03/2023]

Wamba-Taguimdje, S. L., Fosso Wamba, S., Kala Kamdjoug, J. R., & Tchatchouang Wanko, C. E. (2020). Influence of artificial intelligence (AI) on firm performance: the business value of AI-based transformation projects. *Business Process Management Journal*, *26*(7), 1893-1924.Retrieved from: [Retrieved on: 14/03/2023]

Wirtz, B. W., & Müller, W. M. (2019). An integrated artificial intelligence framework for public management. *Public Management Review*, *21*(7), 1076-1100.Retrieved from: https://www.providencepointcommunity.com/files/2012/10/June-2015-Newsletter.pdf [Retrieved on: 14/03/2023]

Yigitcanlar, T., Desouza, K. C., Butler, L., & Roozkhosh, F. (2020). Contributions and risks of artificial intelligence (AI) in building smarter cities: Insights from a systematic review of the literature. *Energies*, *13*(6), 1473.Retrieved from: https://www.mdpi.com/1996-1073/13/6/1473/pdf [Retrieved on: 14/03/2023]